



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/050,334	01/15/2002	Vishnu K. Agarwal	MI22-1913	7861
21567	7590	08/24/2004	EXAMINER	
WELLS ST. JOHN P.S. 601 W. FIRST AVENUE, SUITE 1300 SPOKANE, WA 99201			HUYNH, YENNHU B	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 08/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/050,334

Applicant(s)

AGARWAL ET AL.

Examiner

Yennhu B. Huynh

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 March 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 16-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>3/4/04</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office Action is in response to the Amendment 3/4/04.

Claims 1-15 have been cancelled by the Preliminary Amendment filed on 1/15/02.

Currently, claims 16-29 are pending.

Information Disclosure Statement

The information disclosure statement filed on 1/15/02, 5/8/02, 3/19/03, 4/2/03 9/23/03, and 3/4/04 are being considered by the examiner.

Specification

Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 16, 17 & 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Al Shareef et al. (U.S. 6,281,543B1).

The applied reference has common assignees with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Al-Shareef et al. at figs. 1-7 in related art col. 1-7 disclose a high surface capacitor comprising a double layer electrode, which include:

-Re. claim 16: a surface area enhancement layer 142 over a substrate 126, the enhancement layer having an outer surface area per unit area that is greater than an inner surface area per unit area of the enhancement layer (figs. 8-13); a first capacitor electrode layer 144 (combined by 2 layers: barrier layer 146 and electrode 148) over the enhancement layer, the first electrode having an inner surface area per unit area and an outer surface area per unit area that are both greater than an outer surface area per unit area of the substrate, and the first electrode not comprising the enhancement layer; a capacitor dielectric layer 152 over the first electrode 144 and a second capacitor electrode 154 over the dielectric layer (figs. 12 & 13, cols. 5 & 6, lines 29-64).

-Re. claim 17: wherein the first electrode comprised barrier layer is made of TiN (col.2, lines 44-50).

Art Unit: 2813

-Re. claim 18: wherein the enhancement layer comprises rugged polysilicon 142 over the substrate 126, the first electrode being over the rugged polysilicon (col. 5, lines 29-34).

Claims 22 & 24-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Fukuzumi et al. (U.S. 6,222,722).

Fukuzumi et al at figs. 1-40 in col. 1-12 disclose a capacitor having undulated lower electrode, which include:

-Re. claim 22: an opening 22 in an insulative layer 21 over substrate 2, the opening having sides and a bottom (figs. 1-4); a HSG polysilicon layer 23 over the sides of the opening but not over the bottom; a conformal first capacitor electrode 24, the first electrode being sufficiently thin that the first electrode has a rugged outer surface with an outer surface area per unit area greater than an outer surface area per unit area of the substrate underlying the first electrode; a capacitor dielectric layer 26 on the first electrode and a second capacitor electrode layer 27 over the first dielectric (figs. 18-24, col. 13, lines 46-55).

-Re. claim 24: wherein the polysilicon comprises spaced apart grains (fig. 20).

-Re. claim 25: wherein the first electrode comprises barrier layer 17 is made of TiN (col.10, lines 42-65).

-Re. claim 26: wherein the dielectric layer comprises Ta₂O₅, ZrO₂, BST, HfO₂, Al₂O₃ or ST (col.18, lines 14-18).

Art Unit: 2813

-Re. claim 27: a surface area enhancement layer comprising undoped rugged polysilicon 51 over a substrate 2, the enhancement layer having an outer surface area per unit area that is greater than an inner surface area per unit area of the enhancement layer; a first electrode layer 52 on an in direct contact with the enhancement layer, the first electrode having an inner surface area per unit area and an outer surface area per unit area that are both greater than the inner surface area per unit area of the enhancement layer; a capacitor dielectric layer 53 and an upper capacitor electrode 54 over the dielectric layer (figs. 30-34, col.15 & 16, lines 7-15). In another embodiment, Fukuzumi et al. disclose an enhancement layer 6 contains rugged polysilicon by annealing that can be considered of undoped forming, or any other HSG technology. (col. 7 lines 24-35). Regarding the "undoped of rugged polysilicon" limitation in the claim 27, this is presumed to be inherent to the disclosure of Fukuzumi et al., per MPEP 2112.01, because their disclosed structure is identical to the applicant's structure as claimed in claim 27.

-Re. claim 28: an opening 22 in an insulative layer 21 over substrate 2, the opening having sides and a bottom (fig. 4); a HSG polysilicon layer 23 over the sides of the opening but not over the bottom (figs. 20-24, col. 13, lines 46-55); a conformal first capacitor electrode 7 on the polysilicon 4 convert to HSG layer 6 (fig.4), the first electrode 7 being sufficiently thin that the first electrode has a rugged outer surface with an outer surface area per unit area greater than an outer surface area per unit area of the substrate underlying the first electrode ; a capacitor dielectric layer 26 or 8 (col.8

Art Unit: 2813

lines 3) and a second capacitor electrode layer 27 or 9 (col 8 layer 15-19) over the dielectric (fig.24 and fig. 4).

-Re. claim 29: wherein the first electrode also has an inner surface area per unit area that is greater than the surface area per unit area of the sides of the opening area (fig.16, 32 & 34).

Claim Rejections - 35 USC § 103

Regarding claims 19-21 & 23, Applicant's argument overcome rejections.

Previous rejections are withdrawn.

Allowable Subject Matter

Claims 19-21 & 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance: Prior art do not suggest or disclose a forming a capacitor , which include an enhancement layer comprises undoped rugged polysilicon , wherein the rugged polysilicon comprises spaced apart grains (claims 19,20 & 23); wherein the outer surface area of the first electrode is at least 30% greater than the substrate outer surface area (claim 21).

The limitations of the above claims 19-21 & 23 are neither anticipated nor rendered obvious over prior art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

Applicant's arguments filed 3/4/04 have been considered but they are not fully persuasive.

To claims 16-21 & 23 (page 4): Applicant's arguments regarding Al Shareef's reference were those of common ownership.

* It noted that this statement is sufficient to overcome the 35 USC 103 (a) rejection of claims 19-21 & 23. It does not overcome 35 USC 102(e) rejection of claims 16-18.

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Art Unit: 2813

To claim 22 (p.5): Applicant also argues that the Fukuzumi et al. does not disclose any single capacitor construction that includes each of the claim limitations, and also do not disclose an opening insulative layer and a HSG over the side of the opening but not over the bottom.

Fukuzumi et al. disclose clearly each single capacitor construction that includes limitations cited in the claim 22 (figs. 18-24 col. 11 & 12 lines 41-17). Fukuzumi et al. also disclose an opening insulative layer 21, and having HSG forming over the side of the opening but do not over the bottom (fig. 21, col.11 lines 56-64).

To claim 27 (p.7): Applicant also argues that Fukuzumi et al. does not disclose an enhancement layer containing undoped rugged polysilicon.

* Fukuzumi et al. disclose an enhancement layer 6 contains rugged polysilicon layer 4, wherein the rugged layer formed by annealing that means as of an undoped forming or any other HSG technologies (col.7 lines 24-36).

Regarding the “undoped of rugged polysilicon” limitation in the claim 27, this is presumed to be inherent to the disclosure of Fukuzumi et al., per MPEP 2112.01, because their disclosed structure is identical to the applicant’s structure as claimed in claim 27.

Art Unit: 2813

To claim 28 (p.9): Applicant also argues that Fukuzumi et al. does not disclose conformal first capacitor electrode on the HSG polysilicon layer but not comprising the HSG polysilicon layer as a part of the first electrode.

* Fukuzumi et al. in another embodiment disclose an opening 5 in an insulative layer over substrate 2, the opening having sides and a bottom (fig. 4); a HSG polysilicon layer 4 convert to the HSG layer 6 over the sides of the opening but not over the bottom (figs. 4, col. 7, lines 36-40); and a conformal first capacitor electrode 7 formed on the HSG polysilicon (fig.4).

Applicant also argues that there is no new ground of rejection.

Examiner clarify that the arguments with respect to claims 16-19,21,23 have been considered but are moot in view of the new ground(s) of rejection with Al Shareef et al.

Therefore, this is a final rejection.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

Art Unit: 2813

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yennhu B Huynh whose telephone number is 571-272-1692 . The examiner can normally be reached on 8.30AM-7.00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on 571-272-1702. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-7724.

YNBH,

8/4/04


CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800